

## CLAIMS

What is claimed is:

1           1.     A vehicle frame assembly, comprising:  
2           a first sub-frame;  
3           a second sub-frame rotatably coupled to the first sub-frame; and  
4           a locking mechanism operatively coupled between the first and second sub-frames,  
5     the locking mechanism operative between a first position in which the sub-frames are  
6     rigidly coupled and a second position in which the sub-frames are free to rotate relative to  
7     one another.

1           2.     The frame assembly according to Claim 1, wherein the locking mechanism  
2     comprises an opening in the first sub-frame and a pin movably attached to the second  
3     sub-frame, the pin movable between an extended position in which the pin extends into  
4     the opening in the first sub-frame to rigidly couple the sub-frames and a retracted position  
5     in which the pin does not extend into the opening in the first sub-frame and the sub-  
6     frames are free to rotate relative to one another.

1           3.     A vehicle frame assembly, comprising:  
2           a first sub-frame having a first cross member;  
3           a second sub-frame having a second cross member positioned parallel and adjacent  
4     to the first cross member, the second cross member rotatably coupled to the first cross  
5     member at a center portion of the cross members; and  
6           a locking mechanism operatively coupled between the first and second cross  
7     members at a location away from the center portion of the cross members, the locking  
8     mechanism operative between a first position in which the cross members are rigidly  
9     coupled and a second position in which the cross members are free to rotate relative to  
10    one another.

1           4.     The frame assembly according to Claim 5, wherein the locking mechanism  
2 comprises an opening in the first cross member and a pin movably attached to the second  
3 cross member opposite the opening in the first cross member, the pin movable between  
4 an extended position in which the pin extends into the opening in the first cross member  
5 to rigidly couple the cross members and a retracted position in which the pin does not  
6 extend into the opening in the cross members are free to rotate relative to one another.

1           5.     The frame assembly according to Claim 5, wherein the locking mechanism  
2 comprises:

3           a first opening in the first sub-frame on one side of the center portion and a first pin  
4 movably attached to the second sub-frame opposite the first opening;

5           a second opening in the first sub-frame on the other side of the center portion and a  
6 second pin movably attached to the second sub-frame opposite the second opening;

7           the pins movable between an extended position in which the pin extends into the  
8 openings in the first cross member to rigidly couple the cross members and a retracted  
9 position in which the pins do not extend into the openings in the first cross member and  
10 the cross members are free to rotate relative to one another.

1           6.     A vehicle frame assembly, comprising:

2           a first sub-frame;

3           a second sub-frame;

4           a first bearing plate connected to the first sub-frame, the first bearing plate having  
5 an opening therethrough and a face;

6           a second bearing plate connected to the second sub-frame, the second bearing  
7 plate having an opening therethrough and a face, the second bearing plate face bearing on  
8 the first bearing plate face;

9 a drive shaft having a longitudinal axis which lies substantially perpendicular to the  
10 bearing plate faces, the shaft rotatable in and extending through the bearing plate  
11 openings.

1 7. The frame assembly according to Claim 6, further comprising a retainer  
2 operatively coupled between the shaft and the bearing plates, the retainer configured to  
3 retain the shaft in the bearing plate openings while allowing the shaft to rotate about the  
4 longitudinal axis.

1 8. The frame assembly according to Claim 6, wherein the longitudinal axis is  
2 positioned along a mid-line of the sub-frames.

1 9. The frame assembly according to Claim 6, further comprising a first yoke  
2 disposed at a forward end of the drive shaft and a second yoke disposed at a rearward  
3 end of the drive shaft, the first yoke connectable to a front drive line of a vehicle and the  
4 second yoke connectable to a rear drive line of the vehicle.

1 10. The frame assembly according to Claim 7, wherein the retainer is configured  
2 to apply a compressive force between the first bearing plate and the second bearing plate.

1 11. The frame assembly according to Claim 9, further comprising a joint  
2 connecting one end of the drive shaft to one of the yokes.

1 12. The frame assembly according to Claim 11, wherein the joint comprises  
2 external splines on the one end of the drive shaft and mating internal splines on one of the  
3 yokes.

4           13.   A vehicle frame assembly, comprising:  
5           a first sub-frame;  
6           a second sub-frame;  
7           a center bearing rotatably coupling the second sub-frame to the first sub-frame at a  
8 center portion of the sub-frames; and  
9           a locking mechanism operatively coupled between the first and second sub-frames,  
10 the locking mechanism operative between a first position in which the sub-frames are  
11 rigidly coupled and a second position in which the sub-frames are free to rotate relative to  
12 one another.

1           14.   A frame assembly according to Claim 13, further comprising an outboard  
2 bearing slidably interposed between the first sub-frame and a second sub-frame at a  
3 location away from the center portion of the sub-frames.

1           15.   The frame assembly according to Claim 13, wherein each of the center and  
2 outboard bearings comprise:  
3           a first bearing plate connected to the first sub-frame, the first bearing plate having a  
4 face; and  
5           a second bearing plate connected to the second sub-frame, the second bearing  
6 plate having a face and the second bearing plate face bearing on the first bearing plate  
7 face.

1           16.   A vehicle frame assembly, comprising:  
2           a first sub-frame;  
3           a second sub-frame;  
4           a first bearing plate connected to the first sub-frame, the first bearing plate having  
5 an opening therethrough and a face;

6 a second bearing plate connected to the second sub-frame, the second bearing  
7 plate having an opening therethrough and a face, the second bearing plate face bearing on  
8 the first bearing plate face;

9 a front sleeve extending forward from the first bearing plate along a longitudinal  
10 axis which lies substantially perpendicular to the bearing plate faces;

11 a rear sleeve extending rearward from the second bearing plate along the  
12 longitudinal axis;

13 a tubular bushing extending through the sleeves;

14 a drive shaft rotatable in and extending through the bushing;

15 a first yoke disposed at a forward end of the drive shaft, the first yoke connectable  
16 to a front drive line of a vehicle; and

17 a second yoke disposed at a rearward end of the drive shaft, the second yoke  
18 connectable to a rear drive line of the vehicle.

1 17. The frame assembly according to Claim 16, further comprising a retainer  
2 operatively coupled to the shaft and the bushing, the retainer configured to retain the  
3 shaft and the bushing in the sleeves.

1 18. A split-frame vehicle, comprising:  
2 a frame including a first sub-frame rotatably coupled to a second sub-frame;  
3 an engine supported by the frame;  
4 a transmission operatively coupled to the engine;  
5 a first set of wheels connected to one of the sub-frames;  
6 a second set of wheels connected to the other of the sub-frames;  
7 a drive line operatively coupled between the transmission and at least one of the  
8 sets of wheels; and

9 a locking mechanism operatively coupled between the first and second sub-frames,  
10 the locking mechanism operative between a first position in which the sub-frames are

11 rigidly coupled and a second position in which the sub-frames are free to rotate relative to  
12 one another.

1 19. The vehicle according to Claim 18, wherein the locking mechanism  
2 comprises an opening in one of the sub-frames and a pin movably attached to the other  
3 one of the sub-frames, the pin movable between an extended position in which the pin  
4 extends into the opening to rigidly couple the sub-frames and a retracted position in which  
5 the pin does not extend into the opening and the sub-frames are free to rotate relative to  
6 one another.

1 20. A split-frame vehicle, comprising:  
2 a frame including a first sub-frame rotatably coupled to a second sub-frame;  
3 an engine supported by the frame;  
4 a transmission operatively coupled to the engine;  
5 a first set of wheels connected to one of the sub-frames;  
6 a second set of wheels connected to the other of the sub-frames;  
7 a first drive line connected to the transmission;  
8 a second drive line connected to one of the sets of wheels;  
9 a first bearing plate connected to the first sub-frame, the first bearing plate having  
10 an opening therethrough and a face;  
11 a second bearing plate connected to the second sub-frame, the second bearing  
12 plate having an opening therethrough and a face, the second bearing plate face bearing on  
13 the first bearing plate face; and  
14 a drive shaft having a longitudinal axis which lies substantially perpendicular to the  
15 bearing plate faces, the drive shaft coupled between the first and second drive lines and  
16 rotatable in and extending through the bearing plate openings.

1           21. The vehicle according to Claim 20, further comprising a retainer operatively  
2 coupled between the shaft and the bearing plates, the retainer configured to retain the  
3 shaft in the bearing plate openings while allowing the shaft to rotate about the  
4 longitudinal axis.

1           22. The vehicle according to Claim 20, wherein the longitudinal axis is positioned  
2 along a mid-line of the sub-frames.

1           23. The vehicle according to Claim 20, further comprising a first yoke disposed  
2 at a forward end of the drive shaft and a second yoke disposed at a rearward end of the  
3 drive shaft, the first yoke connectable to a front drive line of a vehicle and the second  
4 yoke connectable to a rear drive line of the vehicle.

1           24. The vehicle according to Claim 21, wherein the retainer is configured to  
2 apply a compressive force between the first bearing plate and the second bearing plate.

1           25. A more than two wheel drive split-frame vehicle, comprising:  
2 a frame including a front sub-frame and a rear sub-frame;  
3 an engine supported by the front sub-frame;  
4 a transmission operatively coupled to the engine;  
5 a front set of steerable wheels drivingly coupled to the transmission through a front  
6 drive train;  
7 a front steering linkage connected to the front wheels  
8 a rear set of steerable wheels drivingly coupled to the transmission through a  
9 second drive train, the second drive train having a first drive line connected to the  
10 transmission and a second drive line connected to the rear set of wheels;  
11 a rear steering linkage connected to the rear wheels;

12            an axial rotator joint rotatably coupling the front sub-frame to the rear sub-frame,  
13            the axial rotator joint including a rotatable drive shaft connected between the first and  
14            second drive lines; and  
15            a locking mechanism operatively coupled between the front and rear sub-frames,  
16            the locking mechanism operative between a first position in which the sub-frames are  
17            rigidly coupled and a second position in which the sub-frames are free to rotate relative to  
18            one another.

1            26.    The vehicle according to Claim 20, wherein steering force is delivered to the  
2            rear wheels by a hydraulic system comprising:  
3            a hydraulic cylinder connected to the rear steering linkage;  
4            a hydraulic pump connected to the hydraulic cylinder; and  
5            a controller connected to the hydraulic pump.